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SOUTH SASKATCHEWAN RIVER
DEVELOPMENT COMMISSION



SOUTH SASKATCHEWAN RIVER DEVELOPMENT PROJECT

1958 to 1960

SOUTH SASKATCHEWAN RIVER DEVELOPMENT PROJECT

SOUTH SASKATCHEWAN RIVER DEVELOPMENT COMMISSION

PROGRESS REPORT FOR THE PERIOD 1958 TO 1960

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MINISTER

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SOUTH SASKATCHEWAN RIVER DEVELOPMENT COMMISSION
THE SOUTH SASKATCHEWAN PROJECT, A PROGRESS REPORT

Project Administration Structure and Responsibilities

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Impact of Project Construction
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Provincial Expenditures on the South Saskatchewan Project,
1959-60

Contracts Awarded to December 31, 1960

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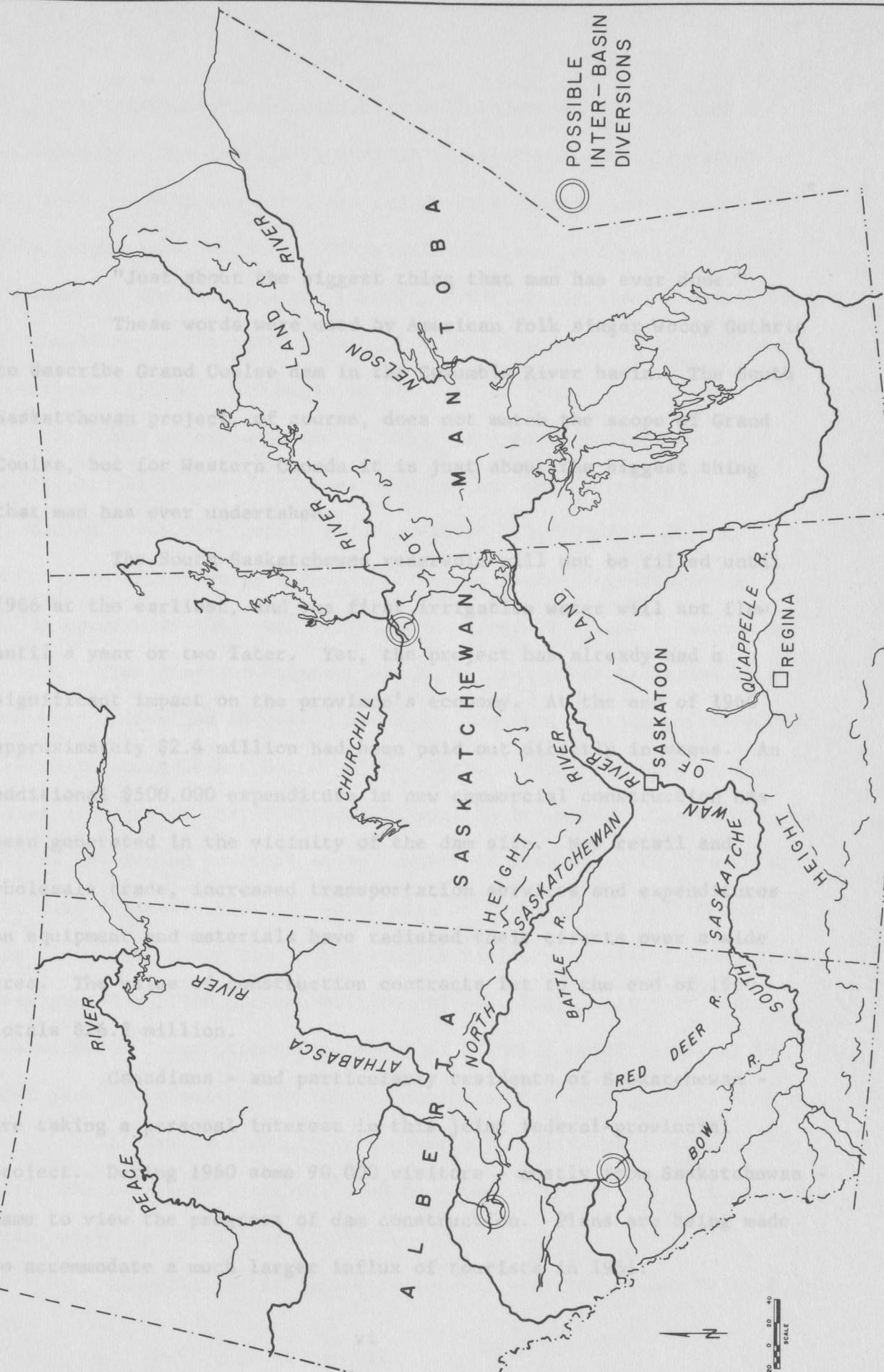
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WATER RESOURCES OF THE PRAIRIE PROVINCES



Reservoir construction is well under way and generally on schedule. The initial raising of the east embankment to about 100 feet has been completed and the west embankment should reach this height by

"Just about the biggest thing that man has ever done."

These words were used by American folk singer Woody Guthrie to describe Grand Coulee dam in the Columbia River basin. The South Saskatchewan project, of course, does not match the scope of Grand Coulee, but for Western Canada it is just about the biggest thing that man has ever undertaken.

The South Saskatchewan reservoir will not be filled until 1966 at the earliest, and the first irrigation water will not flow until a year or two later. Yet, the project has already had a significant impact on the province's economy. At the end of 1960 approximately \$2.4 million had been paid out directly in wages. An additional \$500,000 expenditure in new commercial construction has been generated in the vicinity of the dam site. New retail and wholesale trade, increased transportation services and expenditures on equipment and materials have radiated their effects over a wide area. The value of construction contracts let to the end of 1960 totals \$26.2 million.

Canadians - and particularly residents of Saskatchewan - are taking a personal interest in this joint federal-provincial project. During 1960 some 90,000 visitors - mostly from Saskatchewan - came to view the progress of dam construction. Plans are being made to accommodate a much larger influx of tourists in 1961.

Reservoir construction is well under way and generally on schedule. The initial raising of the east embankment to about 100 feet has been completed and the west embankment should reach this height late in 1961. Work will begin this year on the Coteau embankment, the spillway and tunnels, pointing towards the diversion of the river in the fall of 1963. If this schedule can be maintained, reservoir filling could begin in the fall of 1965.

The water to be stored behind the South Saskatchewan and Qu'Appelle River dams will make possible multiple benefits - including power, irrigation and recreation. Development of these aspects is a provincial responsibility and their co-ordination a major concern of the South Saskatchewan River Development Commission.

The size and location of the initial power installation has now been determined following an exhaustive study of alternatives by the Saskatchewan Power Corporation. Three turbo-generators with a total capacity of 187,500 kilowatts will be situated at the downstream toe of the dam on the west side. They will draw water from three of the five diversion tunnels, which will be lined with steel penstocks. Depending upon river flows, these units will be capable of generating between 350 million and one billion kilowatt hours each year. The Saskatchewan Power Corporation plans to use this capacity mainly to meet peak power demands on its provincial system during winter months.

If dam construction and reservoir filling goes according to plan, the first two turbines could be commissioned by the fall of 1966, with the third ready in 1967.

Important as is this direct power benefit, it may well be

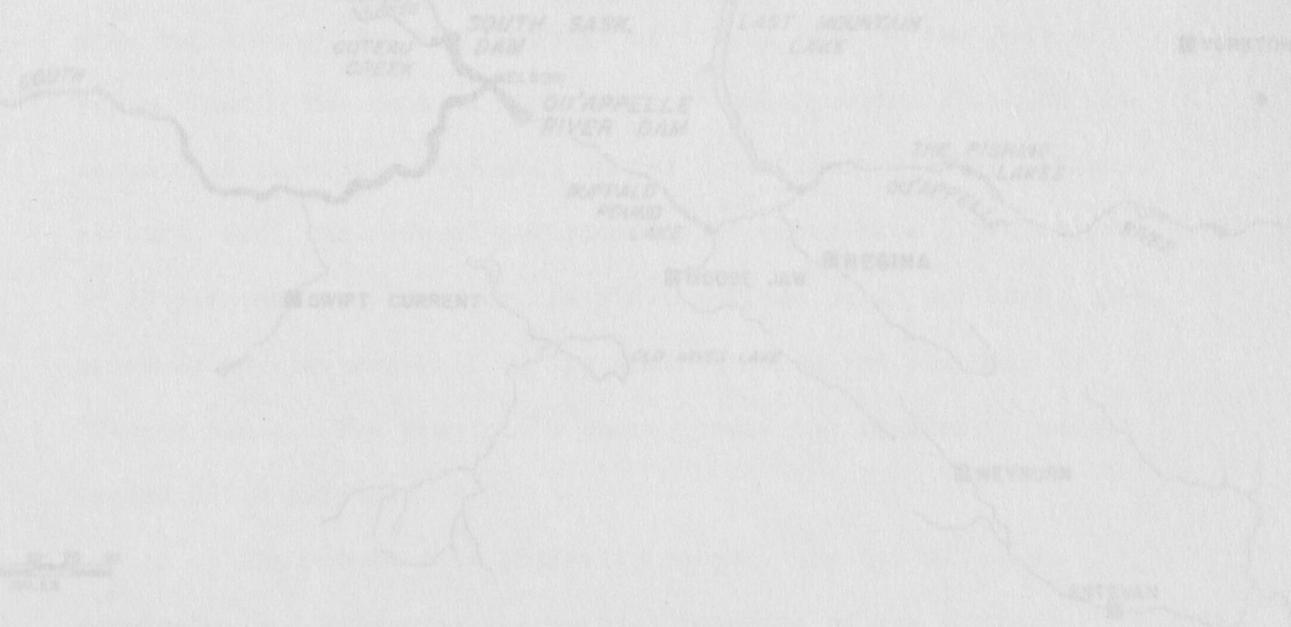
dwarfed by the impact of the South Saskatchewan dam on downstream power development. Control of the flow of the south branch of the river may make possible the use of the entire drop in the river of 600 feet between the South Saskatchewan dam and Squaw Rapids. If present tentative conclusions are borne out, during the next 20 to 30 years several dams may be constructed in the main stem and south branch of the river, each one forming a lake extending back to the foot of the next dam upstream. Thus, in time, downstream installations may be ten times the capacity of the planned installation at the South Saskatchewan dam.

Irrigation is also a significant benefit to be derived from impounding the South Saskatchewan. But its successful development depends upon a complex of physical, economic and social factors. Thus, the Department of Agriculture is continuing intensive studies of the overall design of the irrigation system, of the soils in the irrigable areas and of the major components of a land and irrigation policy. Two to three more years may be required to complete the evaluation of all design and policy alternatives and to arrive at specific recommendations. This timing will fit in well with the projected start on the irrigation of 50,000 acres by 1967 or 1968. The site of this initial development likely will not be selected until the spring of 1963 at the earliest, with full consideration being given to the many studies now under way.

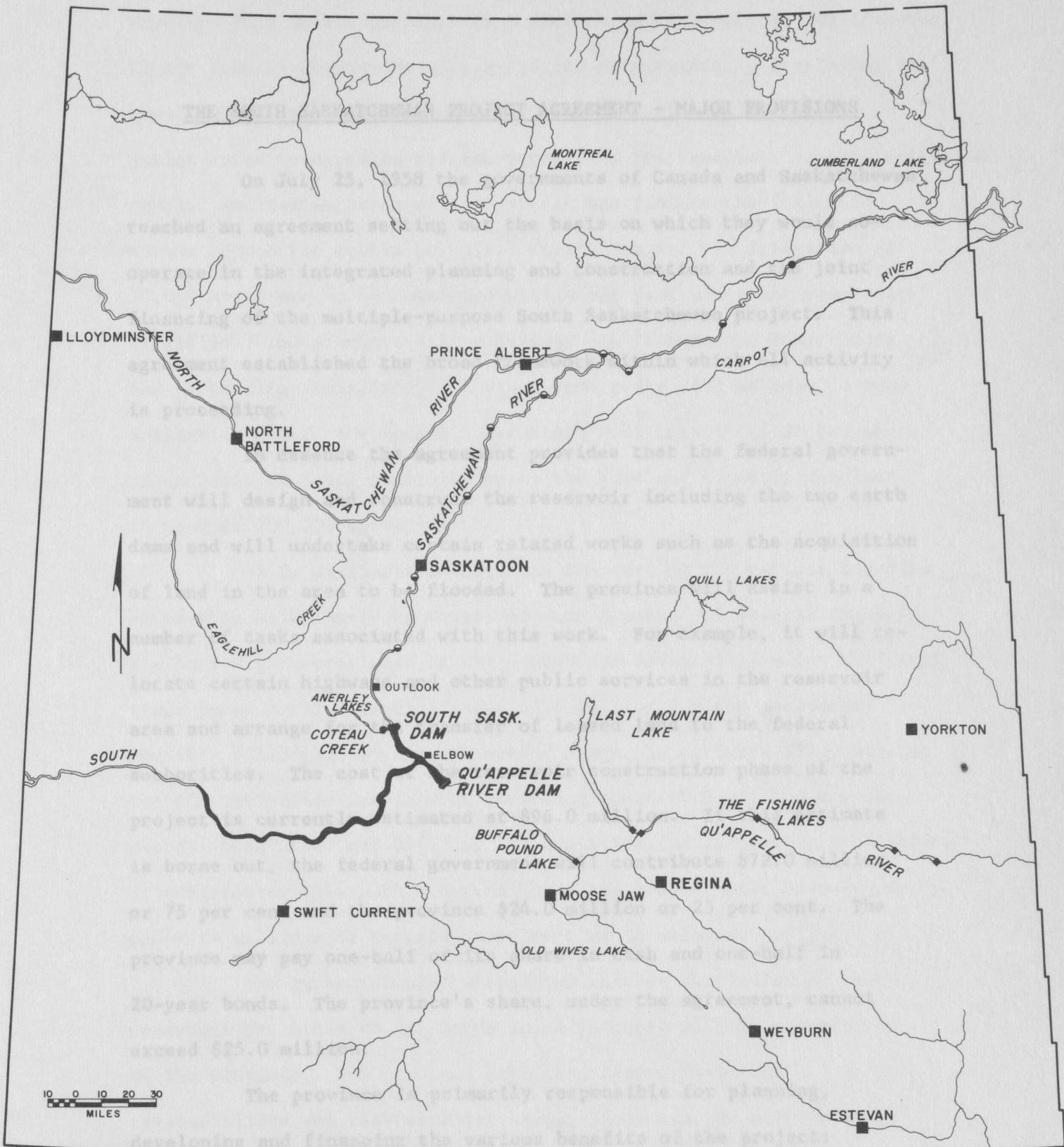
New recreation resources promise to be the big bonus of the project. Preliminary investigations indicate that, with careful planning and pre-development work, the reservoir can, in time, support

a wide variety of outdoor recreation facilities. To be sure, only certain sections of the 500-mile shoreline will be suitable for development, and many problems remain to be solved. Nevertheless, it now seems assured that with proper foresight, planning and time the reservoir can be made into a choice recreation asset.

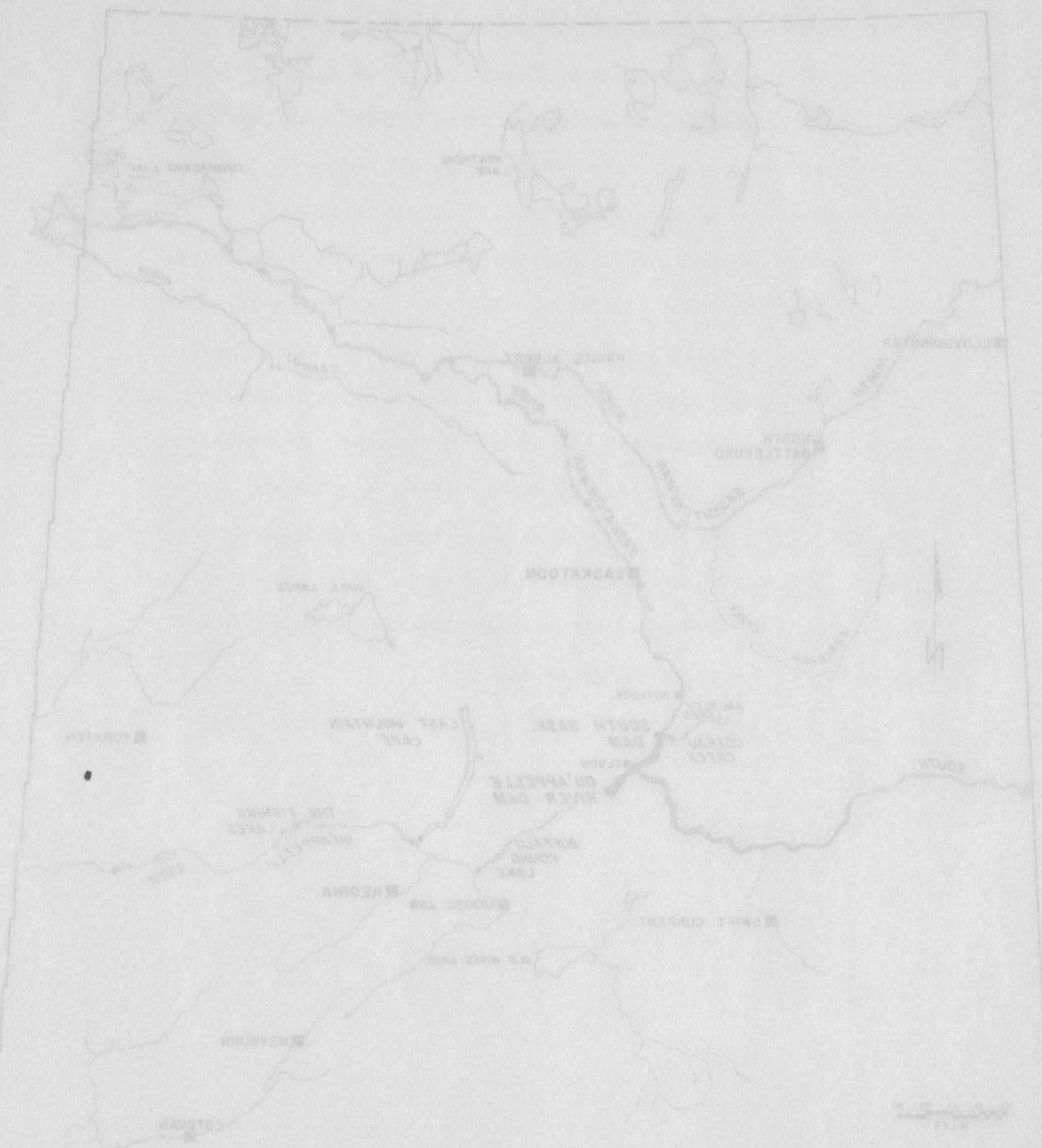
The visionaries - beginning with Henry Hind - who called for a dam on the "river that turns," had many purposes in mind, from navigation to irrigation. Changing times, needs and technology are now turning dreams into reality. Yet we today cannot foresee the full potential of the development of this water resource. The people of Saskatchewan and Canada, working through their governments, are now embarked on this project, committed to a heavy expenditure of public funds. This is a progress report, cautious in its promises, on the developing plans to extract the maximum in public benefits from the harnessing of the South Saskatchewan.



LOCATION MAP



LOCATION MAP



However, just as the province is contributing to reservoir construction, so the federal government will assist to some extent in developing the

THE SOUTH SASKATCHEWAN PROJECT AGREEMENT - MAJOR PROVISIONS

On July 25, 1958 the governments of Canada and Saskatchewan reached an agreement setting out the basis on which they would co-operate in the integrated planning and construction and the joint financing of the multiple-purpose South Saskatchewan project. This agreement established the broad framework within which all activity is proceeding.

In essence the agreement provides that the federal government will design and construct the reservoir including the two earth dams and will undertake certain related works such as the acquisition of land in the area to be flooded. The province will assist in a number of tasks associated with this work. For example, it will relocate certain highways and other public services in the reservoir area and arrange for the transfer of leased land to the federal authorities. The cost of the reservoir construction phase of the project is currently estimated at \$96.0 million. If this estimate is borne out, the federal government will contribute \$72.0 million or 75 per cent and the province \$24.0 million or 25 per cent. The province may pay one-half of its share in cash and one-half in 20-year bonds. The province's share, under the agreement, cannot exceed \$25.0 million.

The province is primarily responsible for planning, developing and financing the various benefits of the project: irrigation, power, recreation and all of the secondary benefits.

However, just as the province is contributing to reservoir construction, so the federal government will assist to some extent in developing the benefits. Canada will contribute 75 per cent of the cost of the outlet works required to release water from the reservoir to the irrigation canals, and Saskatchewan will construct and finance the irrigation system beyond the outlet portals. Facilities for the irrigation of 50,000 acres are to be completed within one year after the reservoir is filled. The province will construct and finance the power house and generating facilities, but since some power will be used to pump irrigation water, the federal government will contribute 25 per cent of the cost of steel penstocks up to the size and capacity required to produce 200,000 horsepower.

It is difficult to estimate the cost of the various benefits since they will likely be developed over a period of several decades. The best figures available at the moment are \$29.0 million for the first stage power works including about \$6.0 million for the penstocks; possibly \$21.0 million for the second stage, an ultimate \$50.0 million for the irrigation development including about \$0.9 million for the outlet structures; and \$10.0 to \$15.0 million for recreation facilities. In addition to this public expenditure, the project will undoubtedly generate millions in private investment as it matures.

The agreement also stipulates that on completion of the reservoir the title to all lands and structures will be transferred to the province. The province will then assume immediate responsibility for reservoir operation, including the allocation of water to project beneficiaries. The federal government will retain

responsibility for reservoir maintenance for a further ten-year period. The costs of maintenance will be paid by the federal government during the first six of these ten years and shared equally during the last four years.

Finally, under the agreement was signed an administrative organization was established to plan, co-ordinate, construct and develop the multiple phases of the project. The general framework of this organization, including the key agencies and their functions, is shown on the following chart.

This rather unique administrative structure was dictated in part by the terms of the agreement itself. In framing the agreement it was recognized that the design and development of the project benefits by the province could not be divorced completely from the design and construction of the dams and reservoir by the federal government. A joint federal-provincial body, the South Saskatchewan River Development Board, was established by the agreement. It was made responsible for co-ordinating activity between the two governments and in particular for co-ordinating the overlapping federal and provincial features of the project.

The administrative structure was also dictated by a basic principle set down by the provincial government after considering alternative organizational forms it might adopt to fulfill its obligations toward the project. A review of experience elsewhere indicated that one or several agencies would have to be made responsible for work in four main areas. First of all, policies and plans for each benefit phase of the project would have to be developed. Second, these policies and plans would have to be

PROJECT ADMINISTRATION: STRUCTURE AND RESPONSIBILITIES

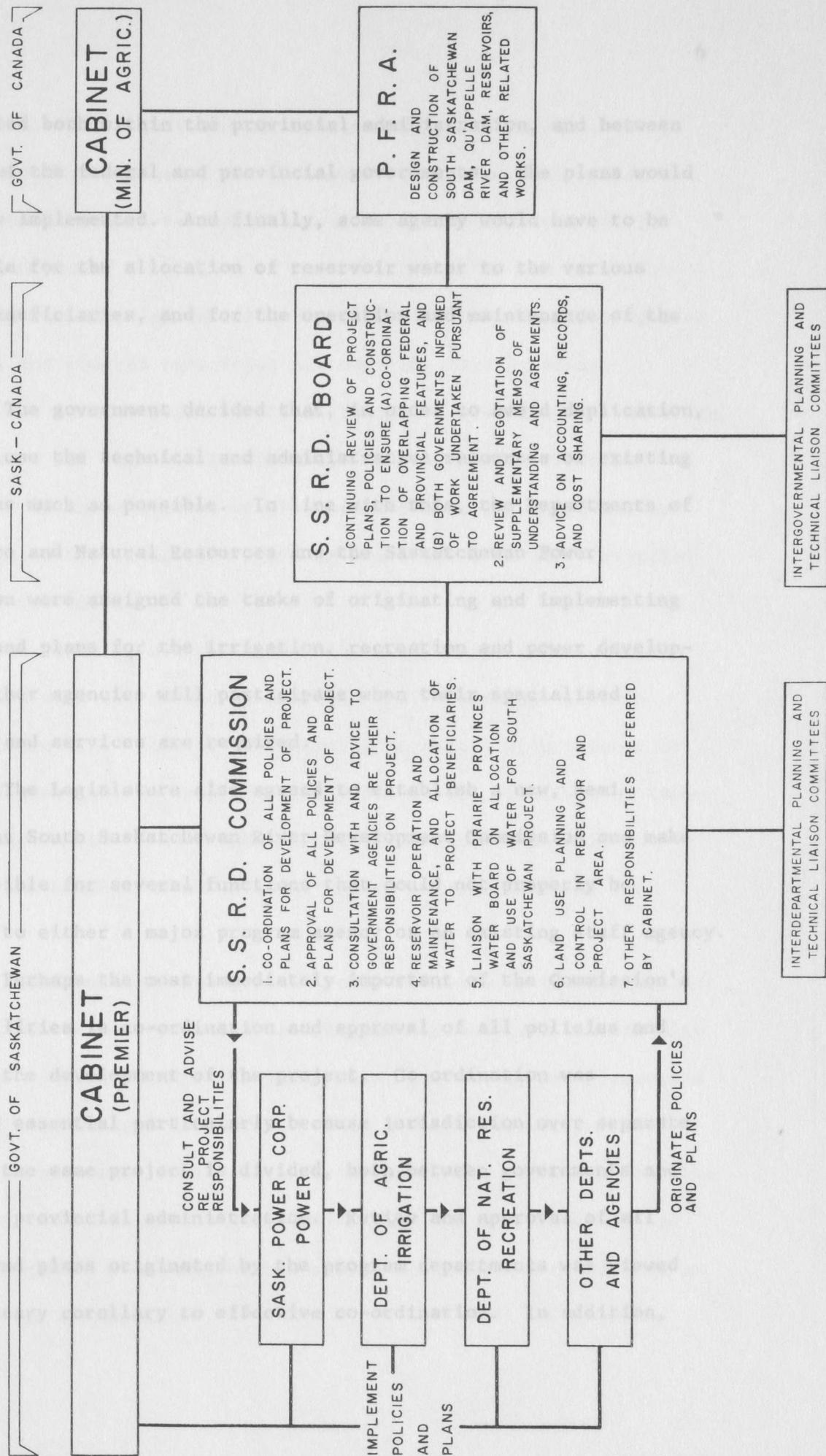
Shortly after the agreement was signed an administrative organization was established to plan, co-ordinate, construct and develop the multiple phases of the project. The general framework of this organization, including the key agencies and their functions, is shown on the following chart.

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SOUTH SASKATCHEWAN RIVER DEVELOPMENT PROJECT

ORGANIZATION CHART



co-ordinated both within the provincial administration, and between agencies of the federal and provincial governments. The plans would have to be implemented. And finally, some agency would have to be responsible for the allocation of reservoir water to the various project beneficiaries, and for the operation and maintenance of the reservoir.

The government decided that, in order to avoid duplication, it should use the technical and administrative resources of existing agencies as much as possible. In line with this, the Departments of Agriculture and Natural Resources and the Saskatchewan Power Corporation were assigned the tasks of originating and implementing policies and plans for the irrigation, recreation and power developments. Other agencies will participate when their specialized knowledge and services are required.

The Legislature also agreed to establish a new, semi-independent South Saskatchewan River Development Commission and make it responsible for several functions that could not properly be delegated to either a major program agency or an existing staff agency.

Perhaps the most immediately important of the Commission's responsibilities is co-ordination and approval of all policies and plans for the development of the project. Co-ordination was considered essential particularly because jurisdiction over separate phases of the same project is divided, both between governments and within the provincial administration. Review and approval of all policies and plans originated by the program departments was viewed as a necessary corollary to effective co-ordination. In addition,

since this is the largest and perhaps most complex project ever undertaken by the province, the government felt that such review and approval was necessary to ensure the fullest consideration of all policies and plans.

The Commission is also concerned with co-ordination between provincial and federal agencies. Although the 1958 agreement established a special Board to effect federal-provincial co-ordination, both its work and that of the Commission has been reinforced by appointment of three members of the Commission to the Board and by designation of the Commission staff as secretariat to the provincial members of the Board.

In carrying out the above mentioned duties the Commission must consult with and advise agencies on their responsibilities toward the project. This is particularly necessary with respect to those agencies required to perform only occasional, specialized tasks. If no agency exists to undertake certain duties the Commission may recommend the establishment of a new agency or undertake the work itself.

The Commission was granted jurisdiction over the operational management of the reservoir and was required to maintain liaison with the interprovincial Prairie Provinces Water Board. It was recognized that the allocation and use of water from a multi-purpose reservoir always poses potential conflicts. Furthermore, the South Saskatchewan reservoir is on an interprovincial river, and its operation must be closely integrated with that of reservoirs upstream and downstream as well as in the Qu'Appelle.

The Commission was also required to ensure that adequate land use controls, zoning by-laws and community planning schemes are enacted in the project and reservoir areas and are effectively enforced. Experience elsewhere suggested that the project would have a profound immediate and long-term effect on land use in the area, and that a chaotic pattern of rural and urban development could occur in the absence of land use controls and community planning schemes.

In carrying out its responsibilities the Commission may require plans, reports and information from all departments and agencies, secure technical advice and assistance from them, and appoint committees and consultants.

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The South Saskatchewan Dam

Progress on the dam and reservoir can be described best in terms of a number of segments or stages.

The first task in August 1958 was to establish a headquarters site and gain access to the working area. This work started with a contract for the east access road. Subsequently, contracts were let for headquarters buildings and services, additional access roads, and for the construction bridge. Altogether 9 contracts with a total value of \$2,670,000 were let for this work. This phase was completed late in 1960.

Once access to the site was established, work could begin on the rolled-earth embankment, the spillway and the tunnels. This work has been divided into stages for contracting and other purposes. Stages I and II concern the east and west embankments of the dam,

RESERVOIR CONSTRUCTION: PROGRESS AND EXPENDITURES

The South Saskatchewan and Qu'Appelle River dams may be viewed as the two physical cornerstones of the project. Behind them the great new water resource will form - the basis of the multiple benefits now being planned. Work on the South Saskatchewan dam is well under way and generally on schedule. Twenty-one contracts had been let up to the end of 1960 with a total value of about \$26.2 million. A list of these contracts is included in the appendix. This work has had a stimulating effect not only on the economy of the immediate region but on that of the province as a whole.

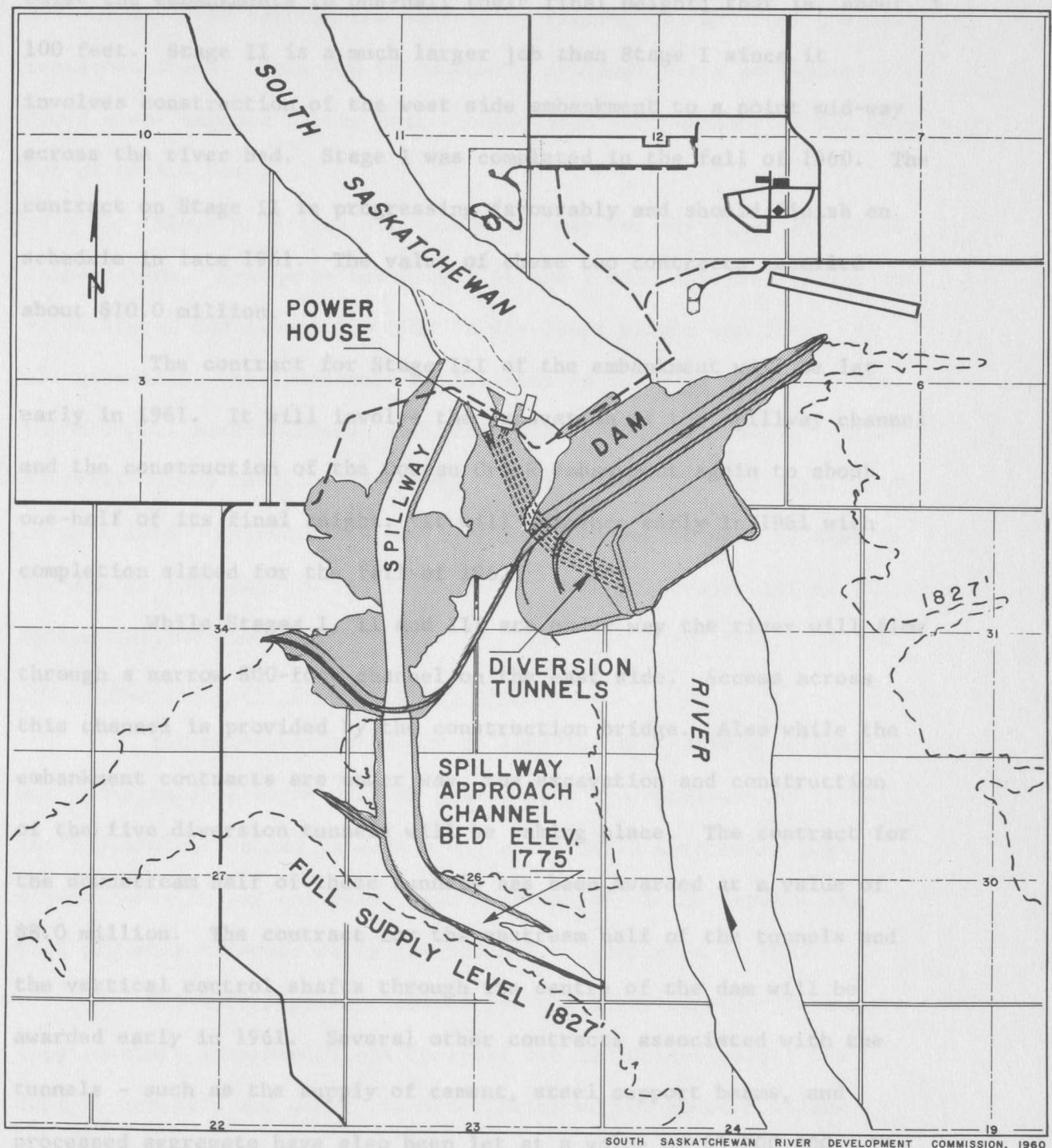
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SOUTH SASKATCHEWAN DAM



tunnels are scheduled for completion early in 1963.

respectively. These contracts involve the stripping of undesirable over-burden material and the placement of selected fill material to raise the embankments to one-half their final height; that is, about 100 feet. Stage II is a much larger job than Stage I since it involves construction of the west side embankment to a point mid-way across the river bed. Stage I was completed in the fall of 1960. The contract on Stage II is progressing favourably and should finish on schedule in late 1961. The value of these two contracts totalled about \$10.0 million.

The contract for Stage III of the embankment will be let early in 1961. It will involve the excavation of the spillway channel and the construction of the Coteau Creek embankment again to about one-half of its final height. It will commence early in 1961 with completion slated for the fall of 1962.

While Stages I, II and III are under way the river will flow through a narrow 800-foot channel on the east side. Access across this channel is provided by the construction bridge. Also while the embankment contracts are under way, the excavation and construction of the five diversion tunnels will be taking place. The contract for the downstream half of these tunnels has been awarded at a value of \$8.0 million. The contract for the upstream half of the tunnels and the vertical control shafts through the centre of the dam will be awarded early in 1961. Several other contracts associated with the tunnels - such as the supply of cement, steel support beams, and processed aggregate have also been let at a value of \$3,700,000. The tunnels are scheduled for completion early in 1963.

The fall of 1963 will mark one of the most significant events associated with the construction. At that time the river will be diverted through the tunnels by closing the 800-foot channel mentioned above. This job is extremely critical since an August flood - not unknown in the past - could mean postponement of the work for an entire year.

River diversion will clear the way for the final stages of construction. Contracts for Stages IV and V will involve raising the structure an additional 110 feet to its final height and form. If all goes well, the dam should be finished in the fall of 1965. The tunnels will then be closed and reservoir filling will begin. The reservoir could be filled as early as July, 1966 - or not until 1967, or even 1968 - depending on river flows. The probability is that if the dam is completed in the fall of 1965, the reservoir will be filled by the fall of 1966.

The Qu'Appelle River Dam and Other Works

The construction of the Qu'Appelle dam, railway relocation and other related works will be phased into the construction of the South Saskatchewan dam in such a way as to avoid abnormally high expenditures in any one year. Construction of the Qu'Appelle dam will probably commence early in 1963 and be completed in 1965.

The 1958 Agreement called for the later negotiation of two supplementary agreements: one to spell out in further detail the design, capacity and other characteristics of the power penstocks toward which Canada will contribute 25 per cent of the cost; and one to set down more precisely the basis upon which Canada will

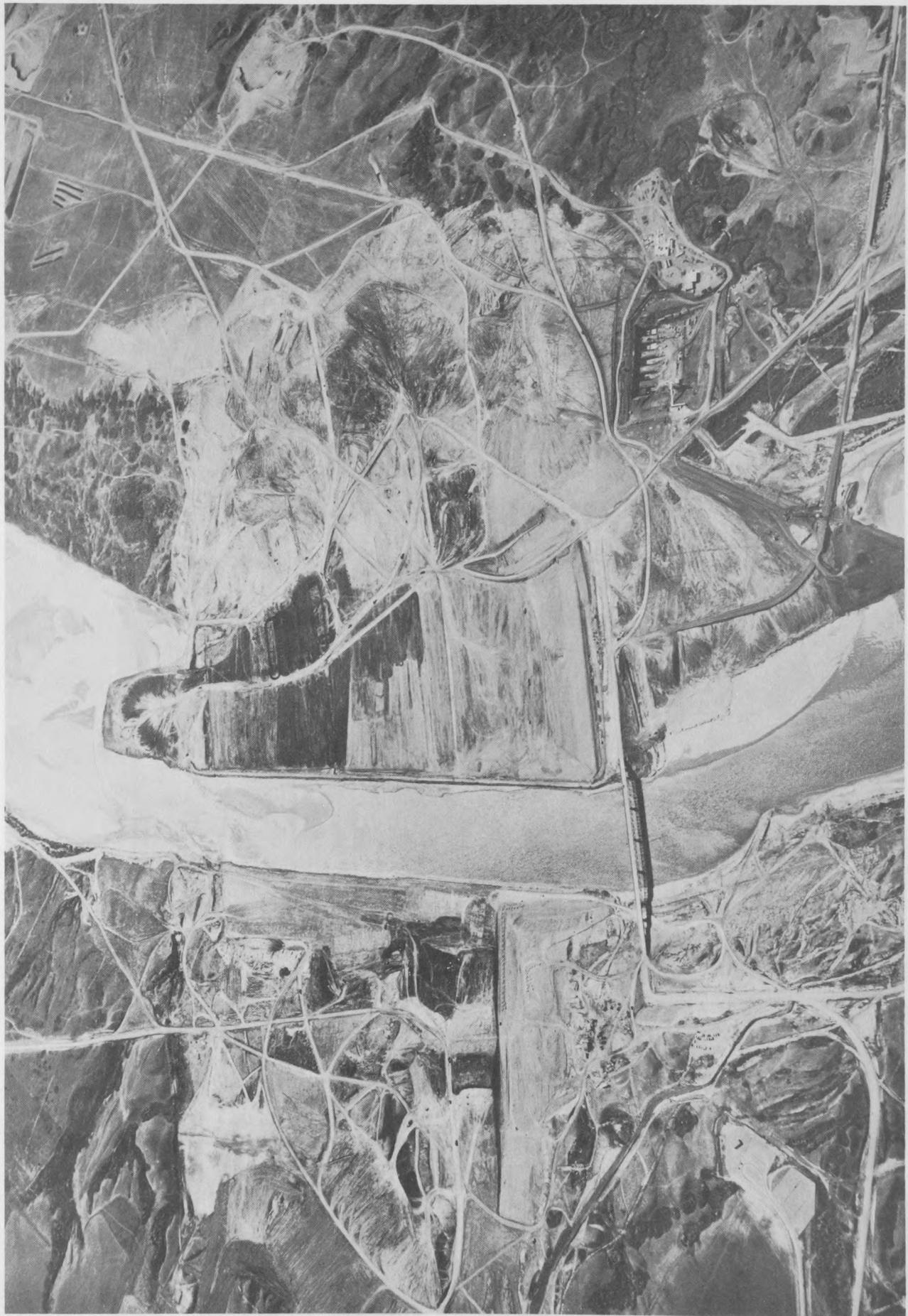
contribute 75 per cent of the cost of relocating certain highways, roads and other facilities in the reservoir area. Both of these agreements may be concluded during 1961.

In the meantime, highway Nos. 19 and 45 have been relocated under the terms of a special Memorandum of Understanding between the two governments. Shortly after the project started it became evident that the early relocation of No. 45 from Birsay north to Tichfield would be desirable in order to provide access to the South Saskatchewan dam from the south and west. Similarly, the early relocation of No. 19 from Elbow southeast to the Qu'Appelle dam and south to No. 42 would obviate the necessity of a special access road into the Qu'Appelle dam. In order to permit an early start on these roads, the governments agreed that Saskatchewan would locate and design them and Canada would let the contracts. Highway No. 45 was completed in the fall of 1960, and No. 19 should be completed by mid-1961.

PFRA Photograph

PANORAMIC VIEW LOOKING SOUTH, SOUTH SASKATCHEWAN CONSTRUCTION AREA TO ELBOW



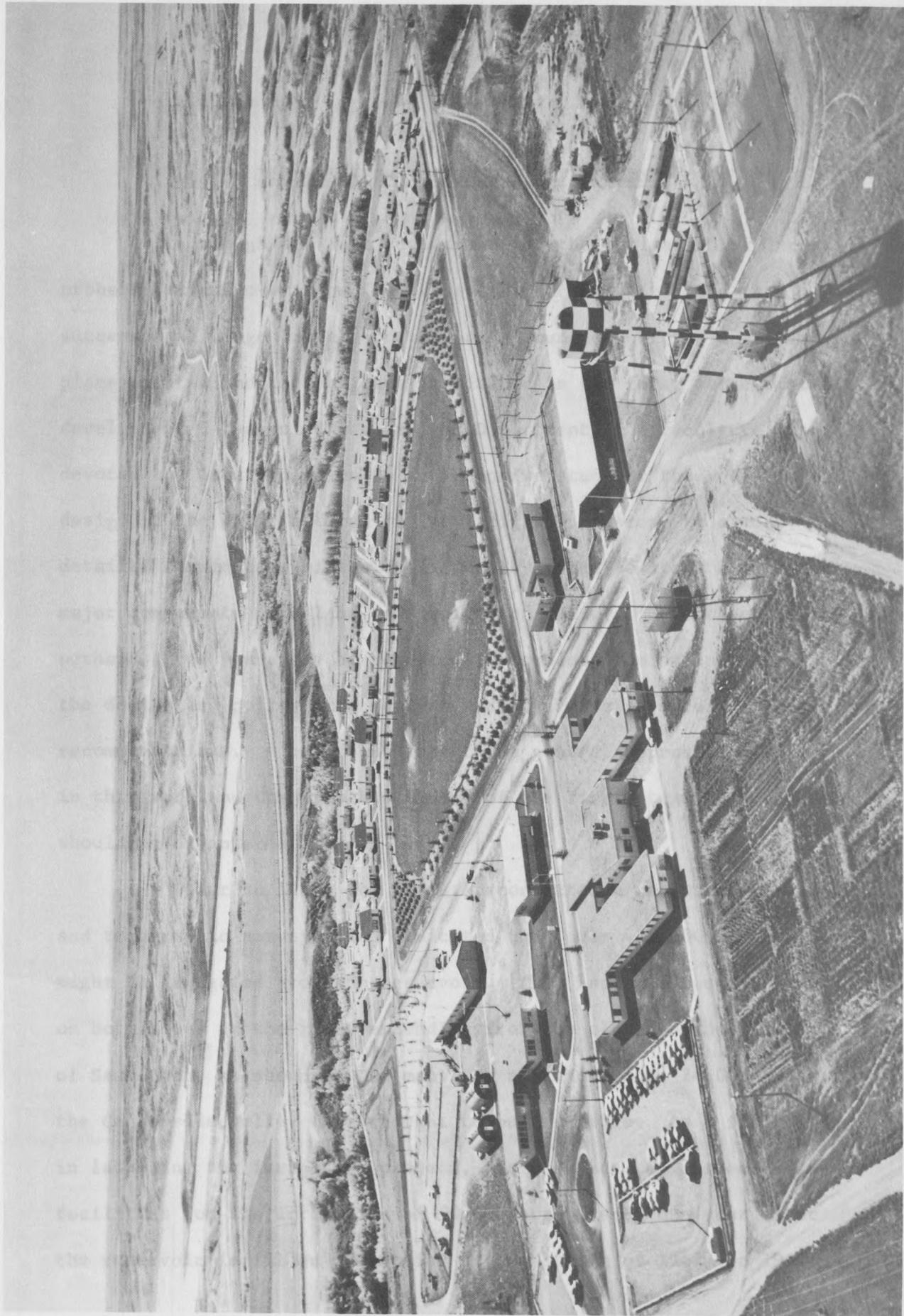


PFRA Photograph

SOUTH SASKATCHEWAN DAM, SHOWING EAST AND WEST EMBANKMENTS,
CONSTRUCTION BRIDGE AND DOWNSTREAM TUNNEL PORTALS

SOUTH SASKATCHEWAN DAM HEADQUARTERS SITE

PFRA Photograph



PLANNING FOR IRRIGATION DEVELOPMENT

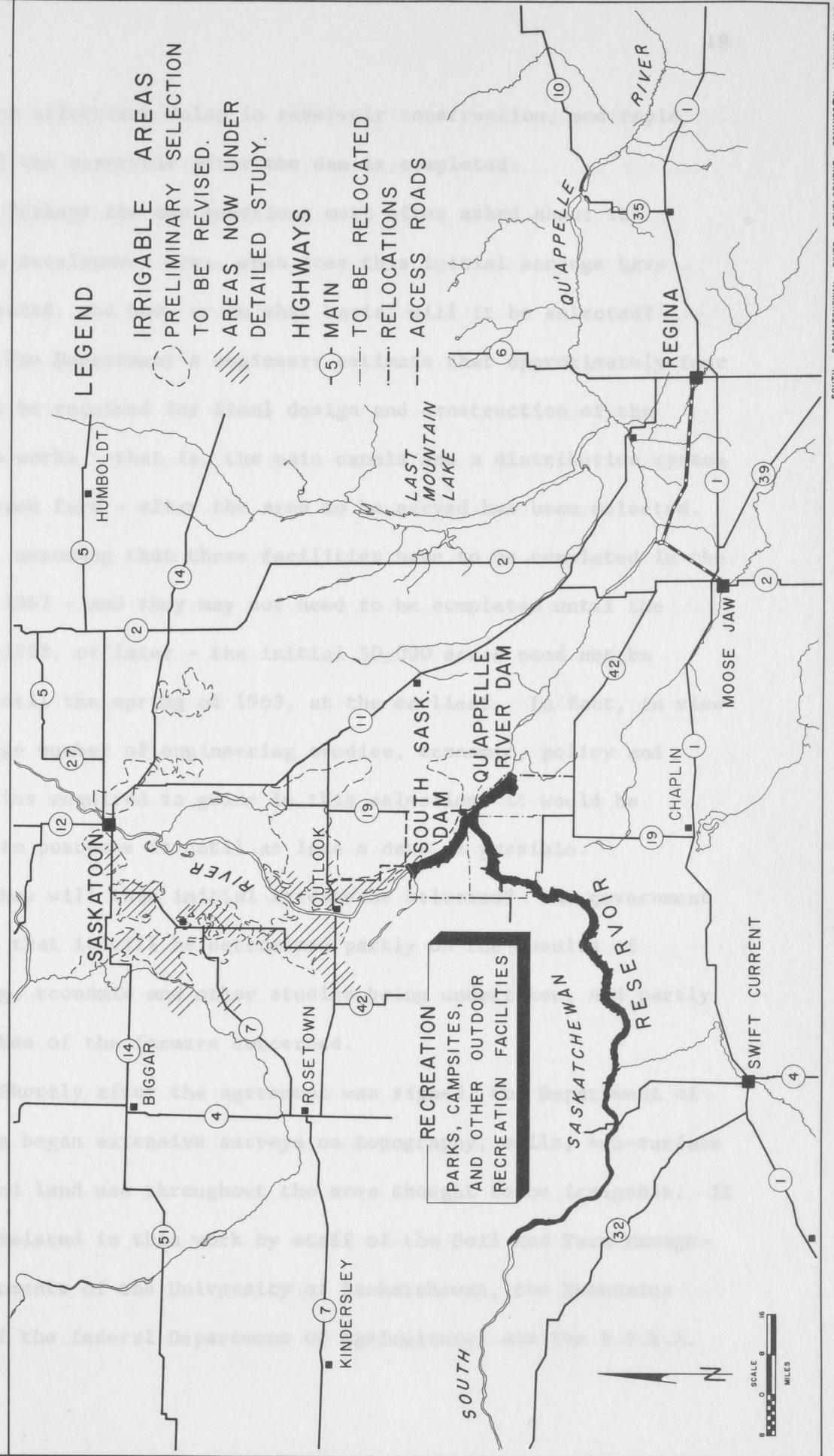
Although the full development of the irrigation project will probably extend over a period of several decades, its long-term success will hinge largely on the basic soundness of the engineering plans adopted and the policies instituted in the first stage of the development. Recognizing this, the Department of Agriculture has devoted the last two years to an intensive study of the overall design of the main features of the irrigation system, to a more detailed examination of the soils in the irrigable areas and to the major components of a land and irrigation policy. A further two and perhaps three years may be required to complete the evaluation of all the design and policy alternatives and to arrive at specific recommendations. A brief outline of the general approach being taken in this work and the probable timing of the first stage development should be of interest.

Prior to 1949, the P.F.R.A. conducted a reconnaissance soil and topographic survey which indicated that over 455,000 acres of land might be irrigated from the reservoir. This land was found in blocks on both sides of the river extending from the elbow to the vicinity of Saskatoon, as shown on the map. In addition, some 24,000 acres in the Qu'Appelle Valley were thought to be irrigable. As a first step in launching the irrigation project, the province has agreed to have facilities for the irrigation of 50,000 acres ready one year after the reservoir is filled - that is, by the spring of 1967, or 1968,

**SOUTH
GENERAL
REFERENCE
MAP**

**RIVER
DEVELOPMENT
PROJECT**

DAMS • RESERVOIR • IRRIGABLE AREA



assuming no unforeseen delay in reservoir construction, and rapid filling of the reservoir after the dam is completed.

Perhaps the two questions most often asked about the irrigation development are: when does this initial acreage have to be selected, and how, or on what basis, will it be selected?

The Department's engineers estimate that approximately four years will be required for final design and construction of the irrigation works - that is, the main canals and a distribution system to serve each farm - after the area to be served has been selected. Therefore, assuming that these facilities have to be completed in the spring of 1967 - and they may not need to be completed until the spring of 1968, or later - the initial 50,000 acres need not be selected until the spring of 1963, at the earliest. In fact, in view of the large number of engineering studies, economic, policy and other studies required to guide in this selection, it would be desirable to postpone it until as late a date as possible.

How will this initial acreage be selected? The government has stated that it will be determined partly on the results of engineering, economic and other studies being undertaken, and partly by the wishes of the farmers concerned.

Shortly after the agreement was signed, the Department of Agriculture began extensive surveys on topography, soils, sub-surface drainage and land use throughout the area thought to be irrigable. It is being assisted in this work by staff of the Soil and Farm Management Departments of the University of Saskatchewan, the Economics Division of the federal Department of Agriculture, and the P.F.R.A.

Drainage Division at Vauxhall, Alberta. This information is essential for a sound classification of the land and for engineering design. The topographic surveys provide data on which the costs of land levelling, distribution systems and main canals can be calculated. The soils and sub-surface drainage surveys indicate the suitability of land for irrigation - soil fertility, texture, chemical content, and ability to permit infiltration of water to depths of 10 feet or more. Land use surveys provide a picture of the present pattern of land use and data on the existing farm economy of the area.

When this information has all been collected, engineers and agronomists will integrate the relevant data on each parcel of land and assign it a classification based upon its soil, drainage and topographic characteristics. The potential productivity of each classification will be determined in part from experience on existing projects in Alberta and elsewhere. It will also be determined from sample farm budgets prepared to estimate the net income that can be expected on a given classification of land through irrigation. Finally, each parcel of land will be assigned a composite rating which will reflect both its physical characteristics and productivity potential under irrigation.

This work has progressed satisfactorily. The Soil Survey has sampled over 1.1 million acres, the Drainage Division has taken some 2,990 borings, and the Department has obtained topographic data on 310,000 acres. Although the surveys and the land classification will not be completed for some time, the work to date indicates that significant changes will be made in the boundaries of the areas

originally classified as irrigable. New areas may be proposed, while others will be reduced, classed as doubtful or eliminated.

As this work has proceeded, the Department's engineers have been selecting and evaluating alternative methods of conveying water from the reservoir to the irrigable areas. Some five basic alternatives for serving the areas on the east side and six for serving the west side are being investigated. These vary from low level gravity canals to higher elevation canals which would be supplied by pump lift. Although these studies are not complete, they have advanced far enough to indicate that alternatives involving the construction of pumping plants to deliver water from the reservoir to the main supply canals should prove more satisfactory than structures for gravity diversion. They would avoid a number of the basic stability problems associated with the gravity system as originally proposed. For these reasons, it has been recommended that gravity outlets not be installed in the main dam.

In addition to these technical studies, the Department has initiated a large number of studies on the economics of irrigation development and on the various components of a land and irrigation policy. These studies should serve to guide government policy respecting the level of capital investment that can be justified in canals and other facilities. They should indicate the market potential for specialty crops, the level of income that various classes of land should experience under irrigation, and the ability of the land to bear operation, maintenance and other costs. They should also serve to guide both the government and farmers concerned

in framing sound policies respecting the rate of irrigation development; credit requirements for land preparation, machinery and other purposes; the responsibilities and powers of a local irrigation district; and other matters.

As these investigations and studies are completed, officials of the Department will take every opportunity to review and assess them with the farmers in the areas. In fact, this process of exchanging information and views has already started. A number of local study groups have been formed and have been meeting regularly during the winter months. Others meet occasionally to discuss progress reports. The Saskatchewan Farmers Union has been active in forming these study groups. No doubt as more information becomes available both the number of groups and the frequency of meetings will increase.

In this way it is hoped that by 1963 - or perhaps a little later depending on the progress of construction - both the government and the farmers in the areas will have the necessary information concerning the implications of various alternatives to form intelligent judgements and come to mutually acceptable decisions.

and the other alternatives had to be abandoned for several reasons, primarily poor foundation conditions or high cost.

It has now been decided that the first stage development will include three turbo-generators with a capacity of 62,500 kilowatts each, or a total of 187,500 kilowatts. They will be located in a power house situated at the downstream toe of the dam on the west side. They will be attached to the downstream end of three of the

five diversion tunnels which will be lined with steel penstocks.

This plant will be capable of generating between 350 million and

1,000 million kilowatts per year.

PLANNING FOR POWER DEVELOPMENT

Plans for the generation of power at the South Saskatchewan dam are beginning to take shape. Shortly after the federal-provincial agreement was signed in 1958, the Saskatchewan Power Corporation began investigations to determine the most economical design of the power installations in the dam. Several difficult problems had to be overcome. Perhaps the most difficult was how best to convey water over or through the dam from the reservoir to the turbines in the power house. The extreme length of the diversion tunnels and the high cost of lining them with steel so that they could be used for power penstocks made it desirable to find a more economical method. Several alternatives were investigated, the most interesting being a huge power canal which would take the water from the reservoir around the west abutment of the dam, along the upper edge of the valley to a point one to three miles downstream of the dam, and then drop the water through short steel penstocks or tubes to a power plant located at the bottom of the valley on the river's edge. Unfortunately this and the other alternatives had to be abandoned for several reasons, primarily poor foundation conditions or high cost.

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five diversion tunnels which will be lined with steel penstocks.

This plant will be capable of generating between 350 million and 1,000 million kilowatt hours each year depending on river flows.

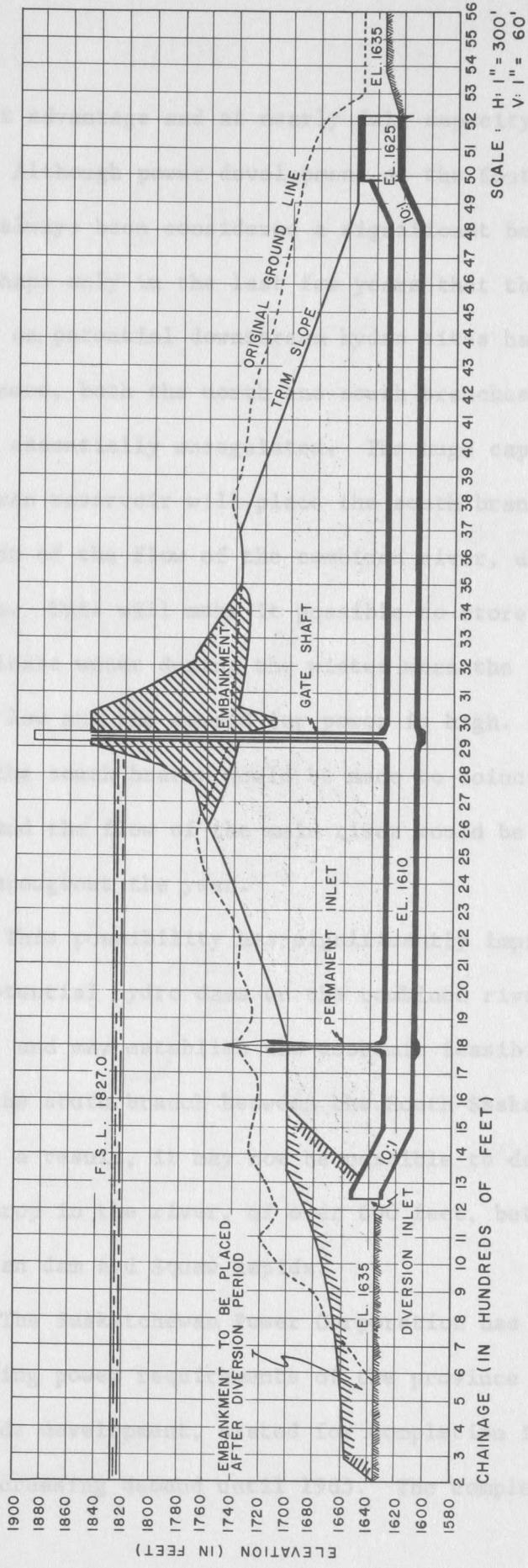
The design of the first stage will allow for expansion of the plant at some future date by the installation of penstocks and turbo-generators in the remaining two diversion tunnels. This would increase the rated capacity of the plant to about 312,000 kilowatts.

The timing of construction of the first stage is dictated by two factors - the expected increase in demand for power, and the need to integrate the construction of the power plant with that of the main dam. The three diversion tunnels will be lined with steel penstocks as they are constructed, that is, between late 1960 and the spring of 1963. As mentioned earlier, barring unforeseen delays the river should be diverted through the tunnels in the fall of 1963. By the fall of 1964, work on the dam should have advanced far enough to permit a start on the foundations of the power house. If this is the case, the power facilities can be completed and the first two turbines commissioned by the fall of 1966, with the third ready by 1967.

The South Saskatchewan power plant should fit effectively into the role of a peak load plant, operating in conjunction with the existing thermal plants throughout the province. The great capacity of the reservoir will enable the hydro plant to provide large amounts of power for peak loads over short periods. The base load of the system can then be carried by fuel-fired stations, such as those at Estevan and Saskatoon, enabling them to operate continuously to

SOUTH SASKATCHEWAN RIVER DEVELOPMENT PROJECT

EMBANKMENT AND TUNNEL PROFILE



SCALE : H: 1" = 300'
V: 1" = 60'

DIVERSION TUNNEL DATA

NUMBER OF TUNNELS	5
AVERAGE LENGTH	4,050 FEET
OUTSIDE DIAMETER	25 FEET
CONCRETE LINING	2 1/2 FEET

PURPOSES

- TO DIVERT THE RIVER DURING LATER STAGES OF DAM CONSTRUCTION.
- TO CONVEY WATER FROM THE RESERVOIR TO TURBO - GENERATORS IN THE POWER HOUSE.

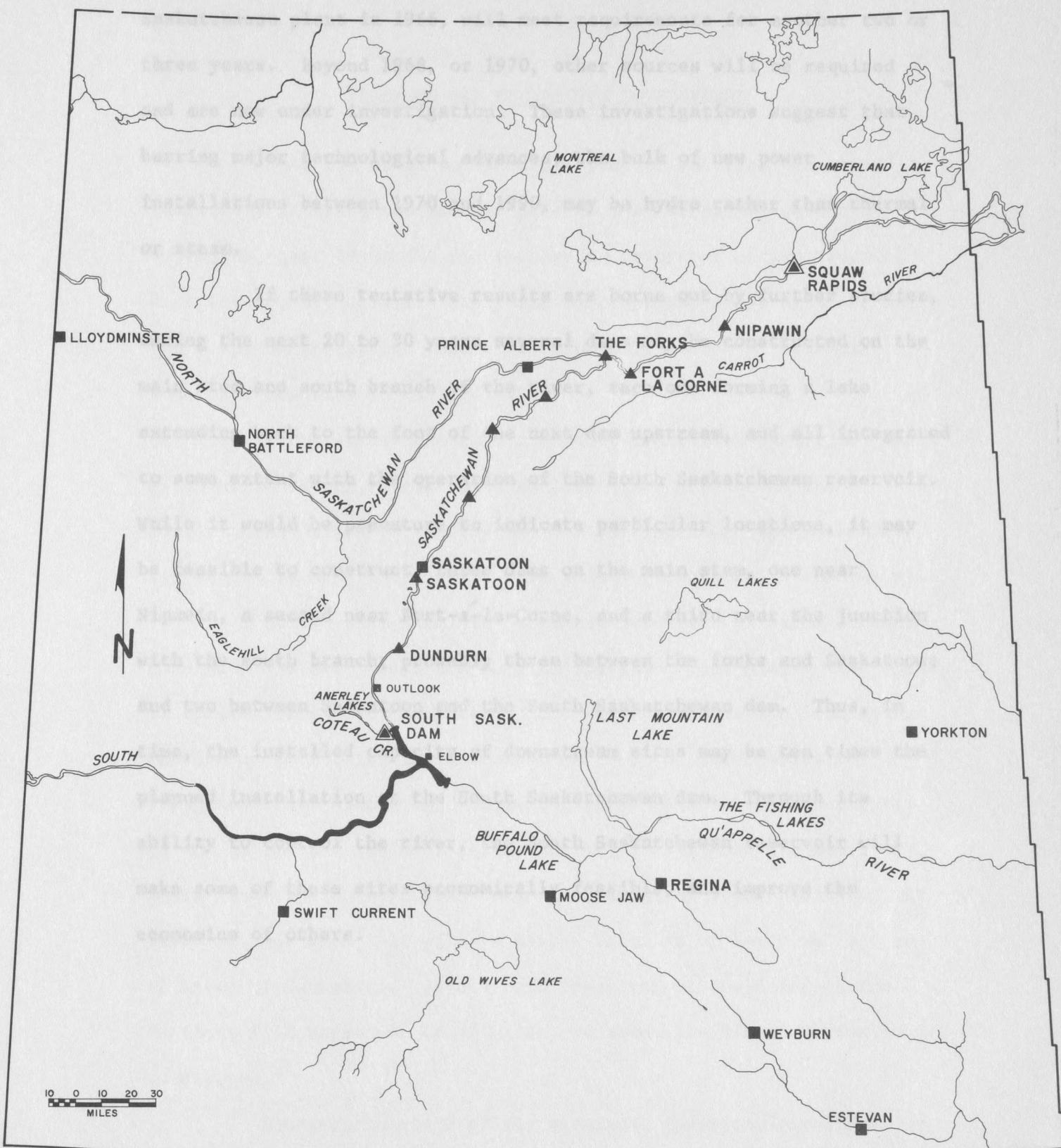
their best advantage and at nearly full capacity.

Although power development at the South Saskatchewan dam site has always been considered a significant benefit of this project, it is perhaps only in the last few years that the impact of the reservoir on potential downstream hydro sites has become apparent. At the moment, both the north and south branches of the Saskatchewan River are essentially unregulated. The huge capacity of the South Saskatchewan reservoir will place the south branch, containing about 50 per cent of the flow of the combined river, under almost perfect regulation. This will make it possible to store peak summer flows and to release water during the winter when the flow in the north branch is low and the demand for power is high. In other words, high flows on the south branch would be made to coincide with high power demands, and the flow of the main river would be made reasonably uniform throughout the year.

This possibility has significantly improved the economics of several potential hydro dams on the combined river between the forks and Squaw, and may establish the economic feasibility of several sites on the south branch between the South Saskatchewan dam and the forks. As a result, it may now be possible to develop the entire head, or drop in the river, of over 600 feet, between the South Saskatchewan dam and Squaw Rapids.

The Saskatchewan Power Corporation has tentatively forecast the expanding power requirements of the province beyond 1980. The Squaw Rapids development, slated for completion in 1963, will likely satisfy increasing demand until 1965. The completion of the South

POTENTIAL HYDRO SITES



Saskatchewan plant in 1966, will meet requirements for another two or three years. Beyond 1968, or 1970, other sources will be required and are now under investigation. These investigations suggest that, barring major technological advances, the bulk of new power installations between 1970 and 1990, may be hydro rather than thermal or steam.

If these tentative results are borne out by further studies, during the next 20 to 30 years several dams may be constructed on the main stem and south branch of the river, each one forming a lake extending back to the foot of the next dam upstream, and all integrated to some extent with the operation of the South Saskatchewan reservoir. While it would be premature to indicate particular locations, it may be feasible to construct: three dams on the main stem, one near Nipawin, a second near Fort-a-la-Corne, and a third near the junction with the south branch; probably three between the forks and Saskatoon; and two between Saskatoon and the South Saskatchewan dam. Thus, in time, the installed capacity of downstream sites may be ten times the planned installation at the South Saskatchewan dam. Through its ability to control the river, the South Saskatchewan reservoir will make some of these sites economically feasible, and improve the economics of others.

It will be within 25 miles of Swift Current and 80 miles of Saskatoon. Future road realignment could reduce the distance from Saskatoon to 63 miles, or about the distance from Regina to Moose Jaw.

However, in spite of its strategic location, experience on similar multi-purpose reservoirs elsewhere suggested that there would

be difficult problem in making the reservoir attractive for recreation. Water levels will fluctuate so considerably during the construction and early operation of the reservoir by

PLANNING FOR RECREATION DEVELOPMENT

When the South Saskatchewan project was first conceived, relatively little attention was paid to its recreation potential. During the past 18 months the recreation resources of the reservoir have been under intensive study and although the investigations are not complete it appears that recreation will be one of the more important benefits of the project.

A tremendous demand for outdoor recreation facilities has grown up in recent years. With an increasing population and a continuation of trends towards shorter working hours and increased per capita income, this demand will probably multiply in the future.

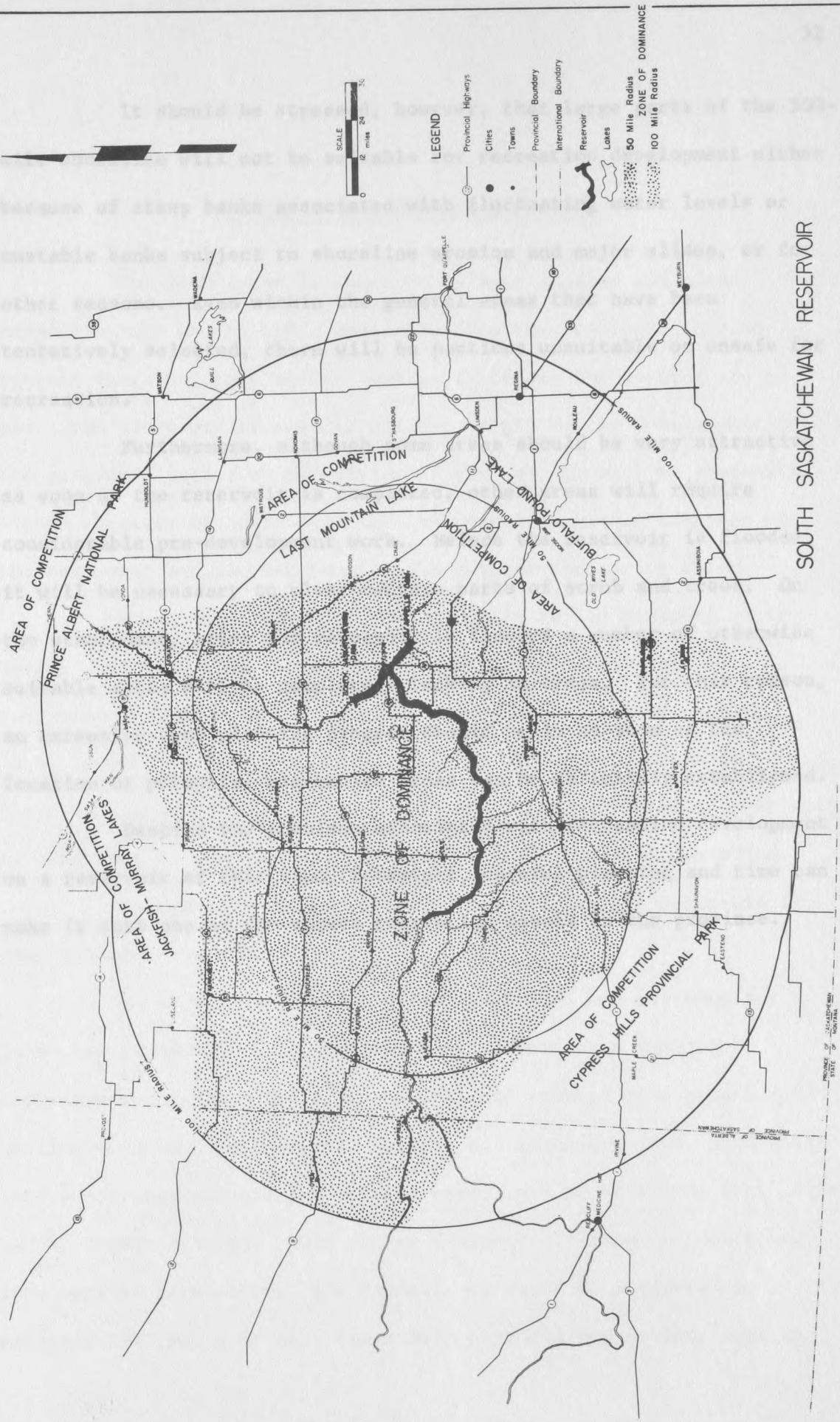
At the same time, the south-western part of Saskatchewan, generally the area south and west of Saskatoon, has always been short of surface water resources to support outdoor recreation facilities. Looking at this after the agreement was signed, the Commission recognized that with a surface area greater than the combined total of the Qu'Appelle chain of lakes, including Last Mountain Lake, the South Saskatchewan reservoir could go a long way towards filling the needs of this area. It will be within 25 miles of Swift Current and 80 miles of Saskatoon. Future road re-alignment could reduce the distance from Saskatoon to 65 miles, or about the distance from Regina to Katepwa.

However, in spite of its strategic location, experience on similar multi-purpose reservoirs elsewhere suggested that there would

be difficult problems in making the reservoir attractive for recreation. Water levels will fluctuate to some extent during the recreation season, portions of the shoreline will be threatened by erosion and subject to bank slides, and most of the existing tree growth will be flooded. As a first step, it was felt that a detailed study should be made of the future shoreline in order to measure and assess its recreation resources, prepare a general plan to guide in their development, and pin-point the more serious problems so that policies could be developed to minimize or overcome them.

In August, 1959, the Commission engaged a recreation consultant and assigned him this task. During the following year, physical investigations were undertaken and submissions were received from over forty municipalities, camping, wildlife and institutional groups.

It would be premature to outline even a general plan of development until the consultant's preliminary reports have been evaluated and until several supplementary studies which he recommended, primarily on sedimentation and shoreline erosion, have been completed. However, with careful planning and pre-development work it seems certain that the reservoir can, in time, support a wide variety of outdoor recreation facilities. There would appear to be a number of areas suitable for development as provincial parks. Other areas appear suitable for regional parks, cottage developments, institutional camp sites and boat launching stations. Some regions which will contain marshes and shallow lagoons may be developed into game and waterfowl management areas.



AREA TO BE SERVED BY RECREATION DEVELOPMENT

It should be stressed, however, that large parts of the 500-mile shoreline will not be suitable for recreation development either because of steep banks associated with fluctuating water levels or unstable banks subject to shoreline erosion and major slides, or for other reasons. Even within the general areas that have been tentatively selected, there will be portions unsuitable or unsafe for recreation.

Furthermore, although some areas should be very attractive as soon as the reservoir is completed, other areas will require considerable pre-development work. Before the reservoir is flooded it will be necessary to clear certain parts of scrub and trees. On the other hand, after the reservoir is flooded a number of otherwise suitable sites will be completely lacking in trees. For this reason, an extensive tree planting program should begin as soon as the location of potential recreation areas can be definitely established.

Despite the problems associated with recreation development on a reservoir of this kind, foresight, careful planning and time can make it into one of the choice recreation assets in the province.

PLANNING FOR RESERVOIR OPERATION

The Commission is required to make studies and plans respecting the use of water available from the reservoir, and to prepare operating regulations that will achieve the optimum use of the river flows and storage at various stages in the development of the project. Later, on completion of the dam, it will be responsible either directly or indirectly for the operation and maintenance of the reservoir and for determining charges for the use of water.

Experience elsewhere, particularly in the Missouri River Basin, indicates that preparing rules and regulations for the operation of this reservoir will be a complex and time-consuming task. Realizing this, the Commission has appointed a Reservoir Planning Engineer to guide the dozens of preliminary studies that will be necessary to test the various alternative methods of operation.

In general, the operation of a multi-purpose reservoir is complicated by several factors.

First of all, the reservoir is planned and designed for joint use of storage by several primary as well as a number of secondary functions. There are no separate storage allocations for particular uses. Instead, all primary and secondary uses, with their individual requirements and special needs, are to be served from joint use of common storage. This raises a number of potential conflicts that must be reconciled. For example, it would be desirable to maintain the reservoir at a reasonably high and stable level during

the summer season for recreation purposes. However, this is the peak period of irrigation demand, as well as high evaporation losses. Fortunately, it appears that the most economic use of the hydro plant will be for winter peaking, thus minimizing a potentially serious conflict between power and other uses.

The size of the reservoir poses an even more difficult problem. The active storage in the reservoir is almost equal in volume to the minimum annual recorded flow. Yet, the historical record of stream flows on this basin indicates that low flows may be sustained over a period of up to ten years. Until there is a major break-through in long-term weather forecasting, this will impose serious limits on the extent to which the reservoir can be drawn down or depleted in any one year.

The problem is complicated further by the fact that this is only one of several reservoirs planned or in existence on the Saskatchewan River system. The operation of the South Saskatchewan reservoir will be influenced by the operation of other reservoirs upstream in Alberta, and will, in turn, influence the operation of downstream reservoirs in Saskatchewan and Manitoba. Preferably, for best use of the water resources of the basin, the annual operation of all of these reservoirs should be integrated. Although interprovincial co-ordination is complicated by divided jurisdiction, it is hoped that some degree of integrated operation can be achieved. Certainly, it will be possible to integrate the operation of reservoirs within Saskatchewan.

The operation of the South Saskatchewan reservoir will also

have to be integrated with the reservoirs in the Qu'Appelle system. The importance of the interrelationship between this project and the Qu'Appelle basin is not generally appreciated.

At the present time, the natural flow of the Qu'Appelle river and its tributaries is able to supply only about 50 per cent of the effective demand for water from these streams in a dry year. In other words, there is a deficiency of 50 per cent for all current uses in a dry year. The cities of Regina and Moose Jaw now depend on Buffalo Pound for an increasing proportion of their water needs, and much of this has to be pumped from the South Saskatchewan river. Without the South Saskatchewan project it has been estimated that the deficiency in supply compared with demand for surface water in the Qu'Appelle would exceed 80 per cent by the year 2000. Barring the discovery of large new underground sources, this would mean an increase in the amount of water pumped from the South Saskatchewan, at considerable annual cost, which in turn would deter population, industrial and general economic growth.

The South Saskatchewan project has virtually eliminated this spectre of a water shortage in the Qu'Appelle basin. When the reservoir is completed it will be possible to release water through the Qu'Appelle dam to flow by gravity into Buffalo Pound and the other lakes in the system. In addition to assuring an abundant supply of water for municipal, industrial and other needs, it will be possible to maintain reasonably stable levels in all of the Qu'Appelle lakes and consequently to improve them as recreation areas.

At the same time, it should be realized that every acre-foot

of water diverted from the South Saskatchewan into the Qu'Appelle reduces the power potential of downstream hydro installations. The Commission is now studying the future water needs of the Qu'Appelle in order to recommend the appropriate size of the outlet works in the Qu'Appelle Valley dam.

The development of industrial sites and residential areas along the proposed highway in the region most likely to be affected. These developments by various municipalities will go to the towns and villages within their boundaries. Generally, the Commission is of the opinion that sound community planning schemes and zoning laws are adopted by the municipalities in the area and are strictly enforced.

Shortly after the first contracts were let for access roads it became apparent that land use along the routes to the dam site would have to be controlled in order to prevent scattered, haphazard commercial development which would interfere with the essential transportation function of the access roads. It was felt that new development, particularly of a temporary nature, should be directed to areas where it would best serve the needs of the construction site, be of greatest benefit to the existing communities, and not jeopardize the long-term development of the project. During the winter of 1958-59 several municipalities in the region enacted land use controls in the form of interim zoning by-laws, and these have been successful in directing new development to approved locations. The municipalities concerned should be commended for their foresight and the manner in which they have administered and enforced their by-laws.

These interim by-laws were framed to guide immediate development, and required as early notice to take into account the longer-term needs.

PLANNING FOR REGIONAL DEVELOPMENT

Anticipating that the project would have an immediate, as well as a long-term impact upon the development of adjacent communities, the Commission was granted special reserve powers respecting land use in the region most likely to be affected. These powers apply to six rural municipalities as well as to the towns and villages within their boundaries. Generally, the Commission is responsible for ensuring that sound community planning schemes and zoning by-laws are adopted by the municipalities in the area and are adequately enforced.

Shortly after the first contracts were let for access roads it became apparent that land use along the routes to the dam site would have to be controlled in order to prevent scattered, haphazard commercial development which would interfere with the essential transportation function of the access roads. It was felt that new development, particularly of a temporary nature, should be directed to areas where it would best serve the needs of the construction site, be of greatest benefit to the existing communities, and not jeopardize the long-term development of the project. During the winter of 1958-59 several municipalities in the region enacted land use controls in the form of interim zoning by-laws, and these have been successful in directing new development to approved locations. The municipalities concerned should be commended for their foresight and the manner in which they have administered and enforced their by-laws.

These interim by-laws were framed to guide immediate development, and required an early review to take into account the longer-term needs of the region. During 1959 and 1960, the Commission, in co-operation with the Community Planning Branch of the Department of Municipal Affairs, undertook a series of studies to achieve a better idea of prospective development in the region. These studies related to population and land use and provided an analysis of existing conditions, trends and prospects. They suggested the need for a general revision of the interim zoning by-laws in order to provide a better basis for development during the next four or five years of reservoir construction. The studies and recommendations were generally welcomed by the five rural and six village councils concerned, most of whom have now proceeded to enact revised land use controls.

The Commission is also required to exercise direct control over land use around the reservoir shoreline. This is necessary in order to guide future development into areas which are free of natural hazards (e.g. shoreline erosion) so that the reservoir may be operated and the shoreline developed for the greatest public benefit. During the next few years, following the completion of a number of essential studies, the Commission hopes to define a development area around the reservoir and zone it for appropriate uses.

Employment EstimatesReservoir and Power Plant Construction I/IMPACT OF PROJECT CONSTRUCTION TO DATE

The primary and secondary effects of the project will not start to materialize for several years, but various factors suggest that construction work already has had a significant impact both locally and throughout the province. While it is impossible to measure this impact precisely, it is evident to some extent in changes in employment and population levels; expenditures on wages, equipment and supplies; and number of new business establishments.

Project Employment and Population Changes

The annual level of employment on reservoir and power plant construction has been estimated for the years 1960-68, as shown in the following table. Although the work has been scheduled to even out annual expenditures as much as possible, employment is expected to increase to a peak of 1,200 in the years 1961 to 1963, and then to decline gradually over the next two to three years. It should be noted that employment on construction of the irrigation system and recreation facilities has not been included in these figures. Such estimates will not be available until plans have advanced further, but they will increase employment levels in the later years. It will also be noted that summer employment is higher than winter employment each year. This reflects the fact that embankment contracts require control over moisture content and compaction of materials, which can be accomplished only during satisfactory weather conditions. The winter decrease is somewhat less during the years 1961 to 1963 when

Employment EstimatesReservoir and Power Plant Construction 1/South Saskatchewan River Development Project

<u>Year</u>		<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
1960-61				
	Summer 2/	800	300	650
	Winter 2/	550	375	450
1961-62				
	Summer	1,200	700	1,000
	Winter	600	400	500
1962-63				
	Summer 3/	1,150	800	1,000
	Winter	600	350	500
1963-64				
	Summer	1,200	600	900
	Winter	400	300	350
1964-65				
	Summer	1,000	550	800
	Winter	475	- 4/	385
1965-66				
	Summer	1,150	-	700
	Winter	450	-	320
1966-67				
	Summer	250	-	170
	Winter	45	-	30
1967-68				
	Summer	35	-	30

1/ Irrigation construction employment estimates are not included.

2/ Summer - May to October; Winter - November to April.

3/ Estimates from May 1, 1962, to April 30, 1965, include the Qu'Appelle River Dam.

4/ Estimates from November 1, 1964, include power plant as well as dam construction. No minimum estimate is available.

Sources: P.F.R.A. estimate prepared Nov. 1960;
S. P. C. estimate prepared Dec. 1959. Revised December, 1960.

the tunnelling contracts will be under way, since this work can proceed more or less independent of the weather.

A rough projection of resulting population changes in the region has also been made covering the same period. The basis for this projection is the employment estimates together with the assumption that 25 per cent of the employees will be drawn from the local area, 50 per cent will live at the contractors' camp for single staff, and 25 per cent will bring their families to the region.

On this basis, in peak employment years, the increase in population both at the construction site and in the adjacent communities due directly to employment on the project should be about 1,200 people. This direct increase generates further additions to the population of the region as new businesses are established to provide goods and services to the project. Using a very conservative multiplier based on experience elsewhere and adjusted because of the temporary and seasonal nature of the work, the indirect increase in population by 1968 should reach 600 people. In 1959 there were 100 new families and in 1960 about 200 new families living in the region, including both project employees' families and those associated with new business establishments. During the next few years about 1,800 new residents may be expected in the region, which is an increase of more than 20 per cent over the normal pre-project population of 8,000.

New Purchasing Power and Increased Trade

Expenditures on the project have injected new purchasing power into the region and will continue to do so. It is estimated that by the end of 1960 about \$2.4 million had been paid out in

wages. Nearly one-half of this was expended during the summer of 1960, when employment averaged 650 and reached a peak of about 850.

By 1968, the cumulative total of wages paid on construction contracts should reach at least \$17.0 million. To date, some 25 to 30 per cent of the labour force on the dam has been drawn from the local area. If this ratio is maintained, resident employees should receive at least a quarter of the total outlay in wages, or over \$4.0 million by the time the reservoir is completed.

In addition, the project has become one of the province's major tourist attractions. More than 90,000 people, mostly Saskatchewan residents, visited the construction site during 1960. Average attendance during the summer season was about 3,000 weekly. From observation points located at a safe distance from construction operations, visitors obtain a panoramic view of activity on both sides of the river. During the summer, photographs, plans and models of the dam and various project benefits are on display in the east side observation pavilion where guides explain features of the project and answer questions. A provincial picnic site nearby overlooks the river and the construction area. A second picnic site is now being planned for the west side of the river, since tourist traffic is expected to increase as the dam, power house and other works begin to take shape.

The increase in population and purchasing power plus the influx of tourists has given a significant boost to retail trade in the region, resulting in the improvement and expansion of existing businesses and the establishment of new ones. The major types of

new business are equipment supply and repair depots; garages and service stations; transport and trucking firms; and such personal and financial services as restaurants, motels, trailer courts and banks. Over thirty new businesses were established in the region from 1958 to the end of 1960. The value of new commercial construction in the region during this period is estimated at approximately \$500,000.

Substantial expenditures on materials and equipment for the project have had an impact in the major cities of the province, as well as in the local region. Saskatchewan firms have participated in such major contracts as the west embankment and downstream tunnel work and have also had some of the supply contracts, such as the supply of ring beams for the tunnels. In addition, many sub-contracts have been let within the province. Up to the end of 1960 approximately \$4.1 million was spent on materials used in construction or in construction aids. About \$1.0 million of this was spent in Saskatchewan. The replacement value of equipment used on the project to the end of 1960 has been estimated at \$9.6 million. About \$4.4 million of this was purchased in Saskatchewan specifically for use on this project. Servicing equipment for operation added a further substantial sum to expenditures within the province. The cost of replacement parts, labour, fuel and fuel transport to the end of 1960 is estimated at \$2.7 million, all of which was spent in Saskatchewan. Thus nearly 60 per cent of the total expenditures on materials, equipment and servicing, or over \$8 million, has been made in the province. There is no doubt that Saskatoon, Regina

and Moose Jaw, as well as a number of other communities, are sharing in the increase in business generated directly by the project.

* * *

It is evident that the South Saskatchewan project has already wrought changes not only in the landscape where construction work is proceeding, but also in the economic and social structure of communities in the region. The comparisons of estimated wages paid and population changes to the end of 1960 with projections of these estimates to the end of the construction period suggest that the effects of the project which are now evident are but the beginning of a period of more dramatic change as construction activity progresses and later as plans for the various project benefits are implemented.

APPENDIX I

Budgeted Expenditures on the South Saskatchewan Project
1939-40

Character of Item	1939-40
1. Capital Construction /	
Department of Agriculture	\$ 61,492
Saskatchewan Power Corporation	62,492
Non-Sharable Items 2/	
1. Irrigation: Department of Agriculture	18,130
Capital	170,637
Ordinary	6,000
2. Power: Saskatchewan Power Corporation	16,492
Ordinary	16,492
APPENDICES	
3. Receipts:	
Ordinary (C.P.R.R. Commission)	16,492
Capital (Dept. of Ind. and Inf.)	16,492
4. Co-ordination: P.S.R.D. Commission	22,300
Ordinary	22,300
	Total
	\$ 452,583

1/ This represents 25 per cent of the total expenditures by P.T.R.A. during 1939-40 on items sharable under the South Saskatchewan Project Agreement.

2/ This includes only direct expenditures associated with the project; it does not include some minor expenditures or a pro-rata share of general government administration and overhead which cannot be segregated.

APPENDIX I

Provincial Expenditures on the South Saskatchewan Project
1959-60

Shareable Items	<u>1959-60</u>
1. Reservoir Construction 1/	
Department of Agriculture	\$ 62,492
Saskatchewan Power Corporation	62,492
Non-Shareable Items 2/	
1. Irrigation: Department of Agriculture	
Capital	18,130
Ordinary	170,697
2. Power: Saskatchewan Power Corporation	
Ordinary	76,000
3. Recreation:	
Ordinary (S.S.R.D. Commission)	16,497
Capital (Dept. of Ind. and Inf.)	14,340
4. Co-ordination: S.S.R.D. Commission	
Ordinary	32,300
	Total \$ <u>452,948</u>

1/ This represents 25 per cent of the total expenditures by P.F.R.A. during 1959-60 on items shareable under the South Saskatchewan Project Agreement.

2/ This includes only direct expenditures associated with the project; it does not include some minor expenditures or a pro-rata share of general government administration and overhead which cannot be segregated.

APPENDIX II

CONTRACTS AWARDED ON SOUTH SASKATCHEWAN PROJECT TO DECEMBER 31, 1960

A. CONTRACTS AWARDED BY P.F.R.A.: Shareable Canada 75% and Saskatchewan 25%

	<u>Contract</u>	<u>Contractor</u>	<u>Price</u>	<u>Description</u>	<u>Progress to December 31, 1960</u>
I.	<u>Site Establishment</u>				
#1	East Access Road	Evans Const. Co., Saskatoon	\$ 172,469.00	Approximately 1.3 miles of grading and gravelling for a road connecting the main dam construction site with #19 north of Loreburn.	Started September, 1958 and completed December, 1958.
#7	North Access Road	Taylor Bros., Regina	168,680.00	Grading and graveling of approximately 15 miles of access highway from the construction site to a point 2 miles south of Broderick.	Started May, 1959 and completed December, 1959.
#3	Headquarters Services	Beattie Ramsay Co., Regina	242,314.50	Sewer and water services and street grading and curbing.	Started November, 1958 and completed Spring, 1959.
#4	Construction Headquarters Buildings	Smith Bros. and Wilson, Regina	738,179.00	Construction of 38 dwelling units, staff house, administration and other buildings to house P.F.R.A. on-site staff.	Started January, 1959 and completed late 1959.
#10	Well-point System	Beattie Ramsay Co., Regina	22,320.00	Includes the sending of well-points near the edge of the river to provide a water supply for the construction headquarters and contractors camps on east side of river.	Started and completed May, 1959.
#11	Pumps	Fairbanks Morse Co., Regina	12,206.00	Purchase of pumps for construction headquarters water system.	Installed December, 1959.
#5	Construction Bridge Substructure	Foundation Co. of Canada, Calgary	339,354.00	Piers and abutments for bridge across the South Saskatchewan River at site of main dam.	Started November, 1958 and completed May, 1959.
#8	Construction Bridge Superstructure	Bird Const. Co., Regina	945,871.00	Includes the steel superstructure, railing and decking for the construction bridge.	Started June, 1959 and completed July, 1960.
#12	Tourist Pavilion	Bird Const. Co., Regina	20,600.00	Construction of a pavilion to house model and displays for sightseers.	Started September, 1959 and completed May, 1960.
Total for Site Establishment					\$ <u>2,661,993.50</u>

Progress to December 31, 1960

<u>Contract</u>	<u>Contractor</u>	<u>Price</u>	<u>Description</u>
II. Embankment			
#6 East Embankment - Stage I	Perini Ltd., Toronto	\$ 2,941,380.00	Consists of 7.5 million cubic yards of excavation and the placing of 5.8 million yards of compacted earth fill on east side of river. This contract will complete the embankment on the east bank of river to about one-half the full height of the dam.
#9 West Embankment - Stage II	Piggott Const. Co., Saskatoon	6,983,458.00	Includes 18 million cubic yards of excavation and 14 million cubic yards of compacted embankment. This embankment will extend from the west wall of the river slightly more than half-way across the valley. It will raise the embankment to about one-half final height.
#19 Relief Wells and Drainage Conduit - Stage I	Piggott Const. Co., Saskatoon	267,081.10	Involves the drilling of a number of wells in the downstream toe of the dam to allow for controlled flow of seepage together with the construction of a concrete conduit to allow drainage from and access to the wells.
Total for Embankment			\$ <u>10,191,919.10</u>
III. Tunnels			
#2 Processing Aggregate	McNamara Const. Ltd., Edmonton	812,030.00	Involves the stripping of the stockpile area and the processing of approximately 700,000 tons of four sizes of concrete aggregate. Some of this aggregate was used for site establishment and embankment.
			Contract let in September, 1958. This contractor had production problems and did not complete work on October 31, 1959 as scheduled. Although contract was completed one year behind schedule, the delay did not affect the overall construction schedule.

<u>Contract</u>	<u>Contractor</u>	<u>Price</u>	<u>Description</u>	<u>Progress to December 31, 1960</u>
#14 Downstream Tunnels	Kewit-Johnson-Poole Const. Cos., Vancouver	\$ 8,964,175.00*	Includes the excavation of the downstream half of the five 4,000-foot long diversion tunnels through the west bank of the river. It also includes placing the steel support beams, lining the tunnels with reinforced concrete and installing steel penstock liners in tunnel #'s 1, 2 and 3 and partial liners (40' long) in tunnel #'s 4 and 5.	Awarded in July, 1960. Slated for completion by December 31, 1962.
#15 Supply of Steel Ring Beams	Commercial Shearing and Stamping Co., Hamilton	2,787,250.00	Includes the supply, fabrication and delivery of 5,500 steel ring beams involving 9,000 tons of steel and 22,000 segments.	Awarded in December, 1959 and completed in August, 1960.
#18 Supply of Cement	Canada Cement Co. Ltd., Montreal	112,965.00	Involves the supply of 17,000 barrels of sulphate-resistant cement to be delivered between August, 1960 and February, 1961 at the call of the tunnel contractor.	Awarded in July, 1960.
Total for Tunnels		\$ <u>11,776,420.00</u>		
* A small portion of the work done under contract #14 is shareable 25% by Canada and 75% by Saskatchewan.				
<u>IV. Highway Relocation</u>				
#16 Revision of Highway #45	Pederson & Co., Swift Current	150,038.00	Construction of 15.1 miles of highway from Birsay north to Tichfield and east to the dam site.	Awarded in November, 1959 and completed in August, 1960.
#17 Revision of Highway #19	Acorn Const. Co., Rivers	256,105.00	Construction of 25.5 miles of highway from #42 Highway to Elbow crossing the Qu'Appelle Valley near the Qu'Appelle Valley dam.	Awarded in May, 1960. Slated for completion in spring of 1961.

Progress to December 31, 1960

This work was completed in December, 1960.

<u>Contract</u>	<u>Contractor</u>	<u>Price</u>	<u>Description</u>
#20 Gravelling of Highway #45 Revision	W. F. Bodkin Const. Ltd., Regina	\$ 14,895.00	Gravelling of #45 revision Birsay to South Saskatchewan River dam site.
#23 Gravelling of Highway #19 Revision	Nick Linden Const., Medicine Hat	\$ 40,800.00	Gravelling of Highway #19 revision from #42 Highway to Elbow.
Total for Highway Revision		\$ <u>461,838.00</u>	
Total Value of Contracts Awarded by P.F.R.A. to December 31, 1960		\$ <u>25,092,170.60</u>	

B. CONTRACTS AWARDED BY SASKATCHEWAN POWER CORPORATION: Shareable Canada 25% and Saskatchewan 75%

Fabrication and Delivery of Tunnel Liner	Sparling Tank and Manufacturing Co., Toronto	\$ 1,119,062.72	Fabrication of approximately 6,000 feet of 20-foot diameter steel tunnel liner and delivery to dam site for installation.
Total Value of Contracts Awarded by Saskatchewan Power Corporation to December 31, 1960		\$ <u>1,119,062.72</u>	
Total Value of Contracts Awarded to December 31, 1960		\$ <u>26,211,233.32</u>	

